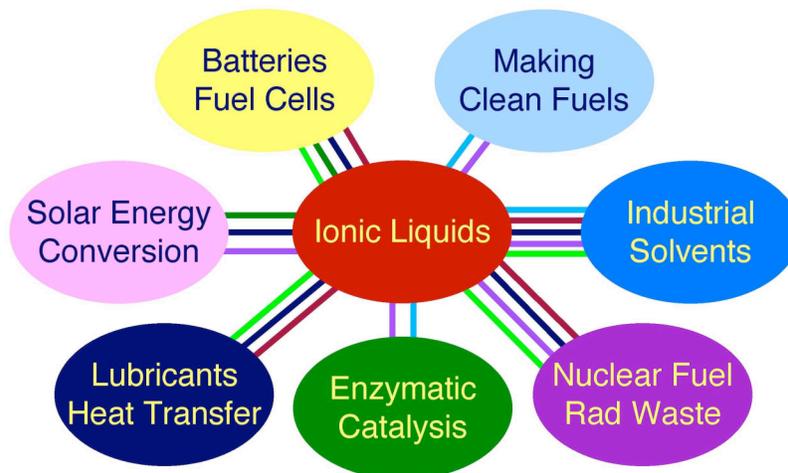


Ionic Liquids: Designer Solvents for a Cleaner World

Featured in the President's FY 2005 Budget Request to Congress
(DOE/Science/Basic Energy Sciences/Chemical Sciences, Geosciences, and Biosciences)

— Non-Volatile — Phase Separation — Solubility Control
— Non-Combustible — Highly Conductive — Viscosity Control



Ionic liquids have already replaced volatile, polluting hydrocarbon solvents in some industrial processes, and progress is being made in using ionic liquids for inherently safe processing of nuclear fuel and radioactive waste. It is important to understand how chemical reaction patterns are influenced by the unusual environment of ionic liquids. New studies have explored fast reactions in ionic liquids by pulse radiolysis and have shown that charged species, such as a bare electron surrounded by solvent, move more slowly in ionic liquids in comparison to neutral species, just the opposite of what is seen in normal solvents. Also discovered was a reactive and highly mobile form of the electron that exists for only a few trillionths of a second in normal solvents but persists thousands of times longer in ionic liquids.

Publications on ionic liquids from the BNL Photo- and Radiation Chemistry Group:

Spectrum and Reactivity of the Solvated Electron in the Ionic Liquid Methyltributylammonium Bis(trifluoromethylsulfonyl)imide J. F. Wishart and P. Neta *J. Phys. Chem. B* **107**, 7261-7267 (2003)

Pulse Radiolysis Study of the Reactions of Hydrogen Atoms in the Ionic Liquid Methyltributylammonium Bis(trifluoromethylsulfonyl)imide J. Grodkowski, P. Neta and J. F. Wishart *J. Phys. Chem. A*, **107**, 9794-9799 (2003)

Effects of Functional Group Substitution on Electron Spectra and Solvation Dynamics in a Family of Ionic Liquids J. F. Wishart, S. I. Lall-Ramnarine, R. Raju, A. Scumpia, S. Bellevue, R. Ragbir, and R. Engel *Radiat. Phys. Chem.* **72**, 99-104 (2005)

Radiation Chemistry of Ionic Liquids: Reactivity of Primary Species J. F. Wishart in "Ionic Liquids as Green Solvents: Progress and Prospects" Rogers, R. D. and Seddon, K. R., Eds.; *ACS Symp. Ser.* **856**, Ch. 31, pp. 381-396, American Chemical Society, Washington, DC, 2003. (ISBN 0-84123-856-1)

Dynamics of Fast Reactions in Ionic Liquids A. M. Funston and J. F. Wishart in "Ionic Liquids IIIA: Fundamentals, Progress, Challenges and Opportunities" Rogers, R. D. and Seddon, K. R., Eds.; *ACS Symp. Ser.* **901**, Ch. 8, pp. 102-116, American Chemical Society, Washington, DC, 2005. (ISBN 0-84123-893-6)

Ultrafast Dynamics of Pyrrolidinium Cation Ionic Liquids H. Shirota, A. M. Funston, J. F. Wishart, E. W. Castner, Jr. *J. Chem. Phys.* **122**, 184512 (2005), selected for the *Virtual Journal of Ultrafast Science* (6/05).

Radiation Chemistry of Ionic Liquids J. F. Wishart, A. M. Funston, and T. Szreder in "Molten Salts XIV" Mantz, R. A., et al., Eds.; The Electrochemical Society, Pennington, NJ, in press.

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